

Description

ADJUSTABLE CASSETTE FOR ACCOMMODATING SUBSTRATES AND METHOD FOR ADJUSTING SAME

BACKGROUND OF INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a storage cassette, and more particularly to a cassette which can be adjusted to adapt to substrates having different sizes.

DESCRIPTION OF RELATED ART

[0002] In handling substrates such as glass substrates for LCDs, cassettes are useful for holding and stowing the substrates and keeping them from contacting each other. The substrates are thus protected from damaging each other. In a manufacturing plant, substrates having different sizes may be produced. Thus, a cassette which can be used to hold or stow different substrates is more versatile and reduces costs.

[0003] A conventional adjustable cassette is described in Japan Yodogawa Kasei publication number H03-273664. The cassette comprises a pair of frames and a group of supporting columns. Each supporting column is provided with a plurality of annular slots defined in a rod made from resin, and defines a threaded hole in each of two opposite ends thereof.

[0004] For adapting to different sized substrates, the frames are panels which define a plurality of holes in different places for joining of the frames to the supporting columns using screws and thereby forming the cassette. According to the size of the substrates to be stowed, the supporting columns are locatable at different positions to form different spaces for accommodating different substrates. To adjust the cassette, a tool such as a screwdriver is needed to unfasten and refasten the screws. In addition, every part must be disassembled and then reassembled. The disassembly and reassembly are troublesome and time-consuming. Moreover, the unfastened screws are liable to be lost.

[0005] For the above reasons, a new cassette which is readily adjusted to adapt to different sized substrates is desired.

SUMMARY OF INVENTION

[0006] An object of the invention is to provide a cassette which is readily adjusted to adapt to different sized substrates.

[0007] In order to achieve the object set forth above, the present invention provides an adjustable cassette for accommodating substrates includes a frame, a pair of supporting plate with a plurality of retaining members facing each other, and an adjusting means for joining of the supporting plates to the frames and thereby forming the cassette. At least one supporting plate can slide away from or close to another supporting plate and be fixed by means of the adjusting means.

[0008] The adjusting means comprises two guiding slots and two positioning slots with keyways defined in each of two opposite sides of the frame, two threaded holes and two through holes defined in each of opposite end portions thereof corresponding to the guiding slots and the positioning slots respectively, a plurality of screw bolts passed through the guiding slots and engaged in corresponding threaded holes, and a plurality of positioning pins located in the through holes and positioning slots.

[0009] Further, the present invention provides a method for adjusting an adjustable cassette, the method comprising: providing a cassette comprising upper and lower supports

with guiding slots and keyways, supporting plates, positioning pins having coil springs therearound, and screw bolts; unscrewing screw bolts slightly so that they are slidable along guiding slots; pressing heads of positioning pins so that stoppers are disengaged from keyways; sliding one supporting plate along upper and lower supports until the distance between supporting plates corresponds to the size of the substrate; releasing pressure on the heads so that coil springs decompress and drive the stoppers to engage in appropriate selected keyways; and tightening the screw bolts.

[0010] When the size of a substrate is larger or smaller than the distance between the two opposing supporting plates, the cassette can be adjusted to fit the substrate. In the adjusting process, only one of the two supporting plates needs to be repositioned, and no part need be detached from the cassette. The risk of misplacing loose parts is eliminated, and the adjusting process is simple and speedy.

[0011] Other objects, advantages and novel features of the invention will become more apparent from the following detailed description of the preferred embodiment of the invention as illustrated in the accompanying drawings, in

which:

BRIEF DESCRIPTION OF DRAWINGS

- [0012] FIG. 1 is an isometric view of a cassette according to the present invention;
- [0013] FIG. 2 is an enlarged view of a portion of the cassette of FIG. 1, showing a screw bolt partly unscrewed and a stopper disengaged from a corresponding pair of keyways;
- [0014] FIG. 3 is an enlarged, isometric view of another portion of the cassette of FIG. 1, showing a screw bolt screwed in and a stopper engaged in a corresponding pair of keyways;
- [0015] FIG. 4 is an enlarged, exploded, isometric view of some of the parts shown in FIG. 2; and
- [0016] FIG. 5 is similar to FIG. 2, but viewed from another aspect.

DETAILED DESCRIPTION

- [0017] Reference will be made to the drawings to describe the invention in detail.
- [0018] Referring to FIG. 1, a cassette 1 comprises a frame 10, two pairs of supporting plates 20, a plurality of positioning pins 30, a plurality of coil springs 50, and a plurality of screw bolts 40. The frame 10 and the supporting plates 20 define a space therebetween for accommodating sub-

strates, and further define an entrance for inserting the substrates into the space.

[0019] The frame 10 is generally box-shaped, and comprises a group of upper supports 101 and a group of lower supports 102 at two opposite sides thereof respectively. The upper supports 101 and the lower supports 102 have a same structure. Referring also to FIGS. 2 and 3, each lower support 102 defines a longitudinal guiding slot 105 and a longitudinal positioning slot 104 therein, the guiding slot 105 and the positioning slot 104 being parallel to each other. Furthermore, the positioning slot 104 comprises a plurality of pairs of keyways 106 at an outer surface of the lower support 102. Each pair of keyways 106 is at opposite sides of the positioning slot 104 respectively. The pairs of keyways 106 are spaced apart from one another at predetermined distances.

[0020] Each supporting plate 20 comprises an upper sliding support 202, a lower sliding support 204, and a supporting body 206 therebetween. The upper sliding support 202 and the lower sliding support 204 have a same structure. Therefore, only the lower sliding support 204 is described in detail herebelow. Referring also to FIG. 4, only a part of the lower sliding support 204 is shown. The lower sliding

support 204 defines a through hole 242 and a threaded hole 244 in each of opposite end portions thereof. A lateral displacement between the through hole 242 and the threaded hole 244 is the same as a distance between the guiding slot 105 and the positioning slot 104. The supporting body 206 is generally plate-shaped, and comprises a plurality of parallel retaining ribs 208 on an inner face thereof. Thus two of the supporting plates 20 face each other, with the retaining ribs 208 thereof being symmetrically opposite each other. The retaining ribs 208 cooperate with each other to retain a plurality of substrates therebetween.

[0021] Referring also to FIG. 5, each positioning pin 30 comprises a head 32 at one end, a main body 34 defining a stopper hole 342 in an end thereof distal from the head 32, and a stopper 60 received in the stopper hole 342. A diameter of the head 32 is larger than that of the through hole 242, and a diameter of the main body 34 is slightly less than the diameter of the through hole 242. One coil spring 50 is engaged around the main body 34 between the head 32 and the stopper hole 342. The coil spring 50 is compressed to enable the stopper 60 to be received in the stopper hole 342 below the lower sliding support 204.

- [0022] Each screw bolt 40 comprises a head (not labeled) and a main body (not labeled). A diameter of the head is larger than a width of the guiding slot 105, and a diameter of the main body is slightly less than the width of the guiding slot 105.
- [0023] The positioning pins 30 and the screw bolts 40 are used for assembling the frame 10 and the supporting plates 20 together and thereby forming the cassette 1.
- [0024] In assembly, one pair of the supporting plates 20 is placed in the space of frame 10, with the retaining ribs 208 thereof facing inwardly toward each other. The through holes 242 and the threaded holes 244 of the upper and lower sliding supports 202, 204 are aligned with the corresponding positioning slots 104 and guiding slots 105 respectively. Eight screw bolts 40 are passed through the guiding slots 105 from an outside of the frame 10 and engaged in corresponding threaded holes 244. The main bodies 34 of the positioning pins 30 are passed through the corresponding through holes 242 and the positioning slots 104 from an inside of the frame 10, and the stoppers 60 are engaged in the stopper holes 342. The coil springs 50 are thereby compressed, and the stoppers 60 are engaged in selected keyways 106. Finally, the sup-

porting plates 20 can be even further secured by tightening the screw bolts 40. Thus the frame 10 and both pairs of the supporting plates 20 are firmly joined together.

[0025] Mounting each positioning pin 30 in the above-described assembly procedure comprises the following steps. First, the main body 34 with the coil spring 50 engaged therearound is extended into the through hole 242. Second, the head 32 is pressed to expose the stopper hole 342 beyond an outer side of the corresponding upper or lower sliding support 202, 204, and the stopper 60 is inserted into the stopper hole 342. The coil spring 50 is also thereby compressed. Third, pressure on the head 32 is released, so that the coil spring 50 decompresses and drives the stopper 60 to engage in a selected pair of keyways 106.

[0026] When the size of a substrate is larger or smaller than the distance between the two opposing supporting plates 20, the cassette 1 can be adjusted to fit the substrate. Normally only one of the two supporting plates 20 needs to be repositioned, as follows. The screw bolts 40 are unscrewed slightly so that they are slidable along the guiding slots 105. The heads 32 are pressed so that the stoppers 60 are disengaged from the keyways 106. The sup-

porting plate 20 is slid along the upper and lower supports 101, 102 until the distance between the supporting plates 20 corresponds to the size of the substrate. Pressure on the heads 32 is released, so that the coil springs 50 decompress and drive the stoppers 60 to engage in appropriate selected keyways 106. Finally, the screw bolts 40 are tightened.

[0027] The cassette 1 of the present invention provides the above-described sliding and fixing means, which essentially comprise the positioning pins 30, the screw bolts 40, the positioning and guiding slots 104, 105, and the through and threaded holes 242, 244. The sliding and fixing means enable easy adjustment of the distance between two opposite supporting plates 20. In the adjusting process, no part need be detached from the cassette 1. The risk of misplacing loose parts is eliminated, and the adjusting process is simple and speedy.

[0028] It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape,

size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.